

ANNUAL RESEARCH REPORT
FY 2002
November 2002

1. Title:

Demographic Characteristics of Spotted Owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades.

2. Principal Investigators and Organizations:

Dr. Robert Anthony (PI) (Demography-RWU 4203); Biologists: S. Andrews, F. Wagner, W. King, T. O'Brien, T. Phillips, G. Rible, and M. Shannon, Oregon Cooperative Fish and Wildlife Research Unit (OCFWRU), Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon.

3. Study Objectives:

- a. Estimate the population parameters of northern spotted owls on the Rogue River and Winema National Forests, specifically fecundity, survival rates, and annual rates of population change.
- b. Elucidate the diet of spotted owls by collecting and analyzing regurgitated pellets.
- c. Communicate results to other researchers examining spotted owl ecology throughout the Pacific Northwest.

4. Potential Benefit or Utility of the Study:

Studying the population biology, foraging ecology, and prey ecology of spotted owls will increase our understanding of factors affecting spotted owl populations. This study offers insights into how conservation can enhance or maintain spotted owl habitat. This study concurrently addresses validation and effectiveness monitoring requirements of the Northwest Forest Plan (1994) as they relate to the management of northern spotted owls.

5. Study Description and Survey Design:

This demographic study collects information on adult and juvenile owl survival rates, reproductive rates, annual rate of population change, and other population characteristics (Franklin et al. 1999). The study utilizes a sample of northern spotted owls within Northwest Forest Plan (1994) Land-use Allocations (LUA) of Late-Successional Reserve (LSR) and Matrix in the southern Oregon Cascades. Of particular interest are owl sites within the five large LSRs on our study area; the LSRs are intended to provide the foundation for recovery of northern spotted owls.

6. Study Area

The Southern Cascades Study Area is approximately 2500 km² in size. The area is geographically situated on lands administered by the Rogue River National Forest (Ashland, Butte Falls, and the eastern portion of the Prospect Ranger Districts) and the Klamath Ranger District of the Winema National Forest.

The study area occupies the southern terminus of the Oregon Cascades including portions of both the western and eastern provinces. Landforms are primarily volcanic in origin and consist of plateaus and moderately dissected terrain (USDA and USDI 1994). The study area lies within the Mixed-Conifer, *Abies concolor*, *Abies magnifica* var. *shastensis*, and *Tsuga mertensiana* zones (Franklin and Dyrness 1973). Owl sites are located at elevations ranging from 945 to 1825 meters.

There are five LSRs associated with the study area; LSR 225, LSR 226, LSR 227, LSR 228, and LSR 229. Of these, LSR 225, 226 and 227 are large LSRs encompassing 16050, 20080, and 40970 hectares, respectively (USDA 1998). LSR 228 and LSR 229 are smaller, incorporating 1130 and 3710 hectares each (USDA 1997). The LSRs are situated entirely within the study area. LSR 227 spans the crest of the southern Oregon Cascades, and is jointly administered by the Rogue River and Winema National Forests.

7. Research Accomplishments (Demography) for FY 2002:

Site Occupancy

In 2002, the number of sites surveyed to protocol increased to 162 locations, and spotted owls occupied 69% of the sites we visited. The number of sites surveyed has increased since 1999. Among the sites that were surveyed, 83 were occupied by pairs, eight by single males and one by a single female. At 19 sites, owls were detected but their social status was not determined (Figure , Table 1).

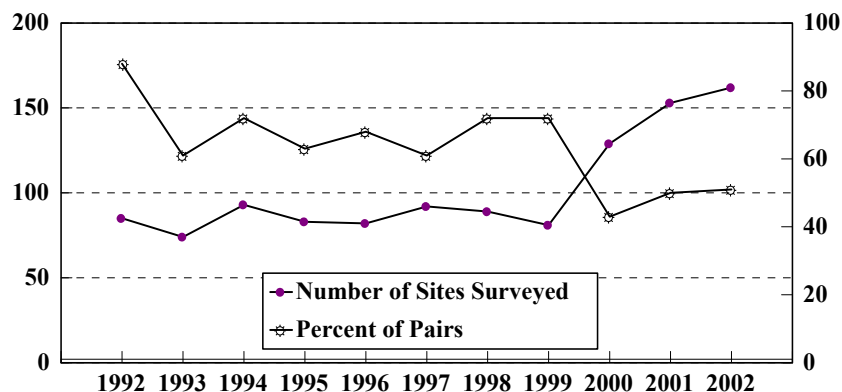


Figure 1. Annual percent of all occupied sites with owl pairs and total number of sites surveyed to protocol on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2002.

Table 1. Number of northern spotted owl sites (territories) surveyed and their respective occupancies on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2002^a.

Year	# Sites Surveyed ^b	# Sites w/ Pairs ^a	# Sites w/ Single Owls ^a	# Sites w/ Social Status Unknown ^c	Total Occupied Sites	# Sites Surveyed and Un-occupied ^d	# Sites Un-determined ^e	% Sites Occupied
1992	85	75	1	6	82	3	29	97
1993	74	45	4	8	57	17	36	77
1994	93	67	5	8	80	13	11	86
1995	83	52	9	11	72	11	22	87
1996	82	56	3	9	68	14	9	83
1997	91	56	4	8	68	23	27	75
1998	88	64	2	7	73	15	35	83
1999	80	58	6	5	69	11	44	86
2000	128	56	10	13	79	49	9	61
2001	153	77	2	19	98	55	0	64
2002	162	83	9	19	111	51	0	69

^aThese figures may differ from previous reports; status as determined by protocol (Forsman 1995).

^bAll sites which were surveyed to protocol.

^cSites with a response by a male and/or female that did not meet pair or single status with \$3 night visits.

^dA minimum of 3 nighttime visits without a response was needed to infer unoccupied status.

^eSites with insufficient visits (#2 nighttime visits) including sites where owls were detected but social status was unknown.

The percentage of sites surveyed to protocol that were occupied by spotted owls increased from 2001, but was less than average for all years ($O = 78.9\%$, $SE = 3.28$, $n = 11$).

In 2002, spotted owls occupied 36 Matrix and 67 LSR sites (Table 2). In the Matrix allocation the percentage of occupied sites increased in 2002 (68%) compared to 2001 (57%). The percentage of sites occupied by owl pairs in the Matrix (47%) was similar to 2001 (45%). Between 2002 and 2001, the percentage of occupied sites in the LSRs (71 vs. 69%) and the percentage of sites occupied by owl pairs (54 vs. 53%) was largely unchanged. The percentage of occupied sites with owl pairs in the LSRs was similar to 2001 (76 vs. 77%), while in the Matrix there was a decline (69 vs. 79%)(Figure 2).

Since 1997 there has been an 96% increase in the number of sites surveyed to protocol for the Matrix allocation, while the number of LSR sites has increased by 70%. Additional years of data are needed before it can be determined whether changes in occupancy for the different Land-use Allocations represent a trend or a consequence of sampling effort.

The number of spotted owl pairs located in 2002 at the five LSRs increased from previous years (see Appendices 1 and 2). In 2002, there were 13 owl pairs located in LSR 225, the largest number recorded to date. Since 1997 there has been an average of 10.0 (SE = 1.13; min. = 7, max. = 13) pairs in LSR 225. In 2002, there were 16 pairs located in LSR 226, a sizable increase from previous years (O = 12.8, SE = 0.86, n = 6; min. = 10, max. = 16). Spotted owl pairs were detected at 18 sites in LSR 227 in 2002 (O = 14.1, SE = 1.61, n = 6; min. = 10, max. = 18), equaling the number located in 2001. As in previous years, one owl pair was located in LSR 228. There were a total of 3 pairs in LSR 229 in 2002 (O = 3.5, SE = 0.25). The number of pairs located at LSR 229 has remained fairly constant since 1997 (min. = 3, max. = 4).

Table 2. Number of spotted owl sites surveyed to protocol and their respective occupancies, stratified by Land-use Allocation, on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1997-2002^a.

LUA ^{bc}	Year	# Sites Surveyed	# Sites w/ Pairs	# Sites w/ Single Owls	# Sites w/ Social Status Unknown	Total Occupied Sites	# Sites Surveyed and Un-occupied	# Sites Un-determined	% Sites Occupied
Matrix	1997	27	19	1	2	22	5	10	82
	1998	24	18	0	1	19	5	13	79
	1999	19	16	0	2	18	1	18	95
	2000	38	17	1	5	23	14	7	61
	2001	49	22	2	4	28	21	0	57
	2002	53	25	3	8	36	17	0	68
LSR	1997	56	34	3	5	42	14	17	75
	1998	57	39	2	6	47	10	21	83
	1999	54	38	6	2	46	8	26	85
	2000	83	34	9	8	51	32	2	61
	2001	90	48	0	14	62	28	0	69
	2002	95	51	5	11	67	28	0	71

^a Sites with Land-use Allocation designation "Other" not reported.

^b See table 1 for column heading definitions.

^c See the Northwest Forest Plan (1994) for a description of Land-use Allocation management strategies.

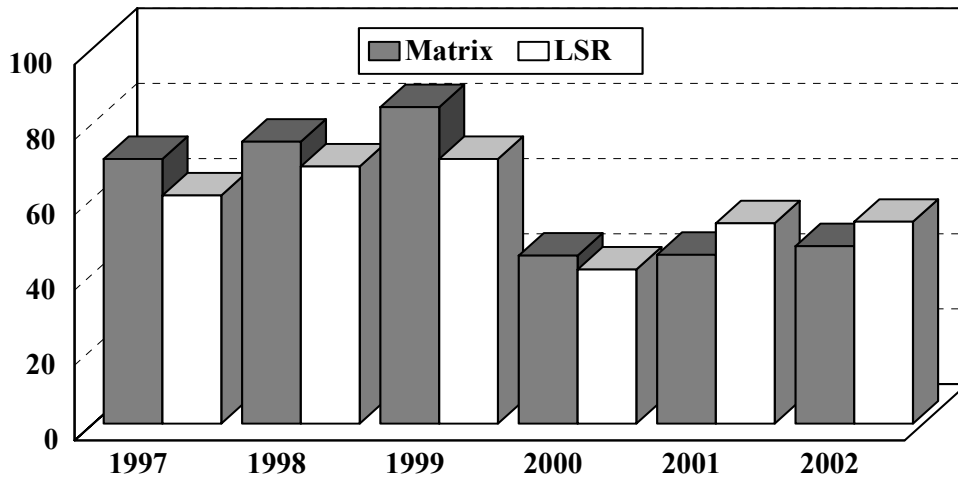


Figure 2. Percentage of sites surveyed to protocol that were occupied by northern spotted owl pairs, stratified by Land-use Allocation, on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1997-2002.

Age and Sex Composition

In 2002, a minimum of 173 non-juvenile and 98 juvenile owls were detected. Of the non-juvenile owls located on the study area, 91.9% were adults (3 years old) and 8.1% were subadults (Table 3). We could not ascertain the age of 14% of the study population, which was similar to most years of the study ($O = 13.5\%$, $SE = 2.10$, $n = 11$)(Table 3). The majority of unknown aged owls were auditory detections.

During the course of the study there have been fluctuations in the number of subadults in the study population (min. = 4; max. = 14)(Table 3). The average ratio of adults to subadults for all years combined was approximately 19:1. The 2002 ratio of adult to subadult owls of approximately 11:1 was slightly lower than average, and was lower than in 2001 (15:1).

The male:female sex ratio for non-juveniles on the study area has favored males in every year of the study. The average sex ratio for all years of the study has favored males by approximately 1.21:1. In 2002 the sex ratio continued to favor males (1.23:1). Whether this difference was an artifact of survey methodology, detect ability, territoriality, or some other factor(s) has not been determined.

Table 3. Age and sex composition of northern spotted owls detected on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2002^a.

Year	Adults (M,F)	Subadults (M,F)	Age Unknown (M,F)	Age Combined (M,F)	Juveniles ^b
1992	123 (70,53)	4 (2,2)	64 (30,34)	191 (102,89)	97
1993	113 (62,51)	9 (4,5)	17 (10,7)	139 (76,63)	13
1994	130 (66,64)	8 (4,4)	13 (9,4)	151 (79,72)	55
1995	111 (59,56)	8 (6,2)	13 (10,3)	136 (75,61)	20
1996	112 (56,56)	5 (4,1)	13 (7,6)	130 (67,63)	39
1997	111 (63,48)	7 (2,5)	14 (7,7)	132 (72,60)	16
1998	131 (69,62)	4 (3,1)	18 (12,6)	153 (84,69)	45
1999	119 (69,50)	5 (1,4)	16 (10,6)	140 (80,60)	12
2000	110 (65,45)	10 (2,8)	20 (14,6)	140 (81,59)	58
2001	147 (78,69)	10 (4,6)	22 (17,5)	179 (99,80)	16
2002	159 (88,71)	14 (6,8)	28 (17,11)	201 (111,90)	98

^aOwls of undetermined sex and age not included in tabulation.

^bJuvenile owl numbers represent the yearly total number of young located from 1 April to 31 August.

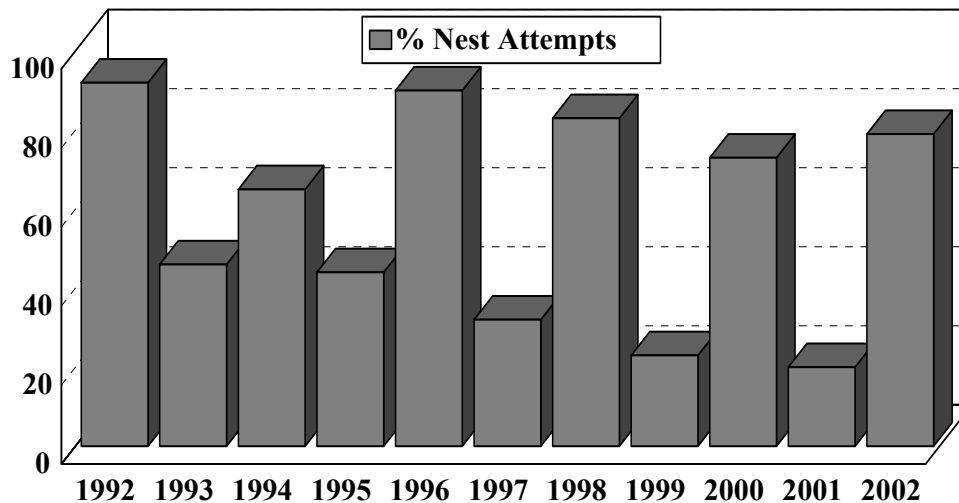


Figure 3. Percentage of northern spotted owl pairs attempting to nest on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2002.

Nest Success

We checked 61 owl pairs for nesting success in 2002. Of these, 48 pairs (79%) attempted to nest. On average, 59% (SE = 8.01) of pairs have attempted to nest in each of the last eleven years. Annually, the rate of nest failure has been approximately 15% (SE = 3.46). Seven sites (15%) where nesting was attempted failed to fledge young in 2002. The proportion of nesting failures appears to be unrelated to the proportion of pairs attempting to nest ($F = 0.024$, $p = 0.8812$, $df = 9$).

Over the course of the study there have been wide annual fluctuations in both the percentage of pairs nesting (min. = 20%; max = 92%) and the percentage of pairs fledging young (min. = 14%; max. = 90%). The tendency is for high and low reproductive years to alternate with even and odd years, respectively (Figure 3).

Reproductive Success

The average number of young produced per total number of pairs surveyed to protocol in 2002 was 1.30, which was greater than the mean for all years of the study ($O = 0.75$, $SE = 0.149$, $n = 11$)(Figure 4). The average number of young produced per successfully reproducing pair in 2002 (1.88) was higher than in most years ($O = 1.66$, $SE = 0.055$, $n = 11$)(Table 4).

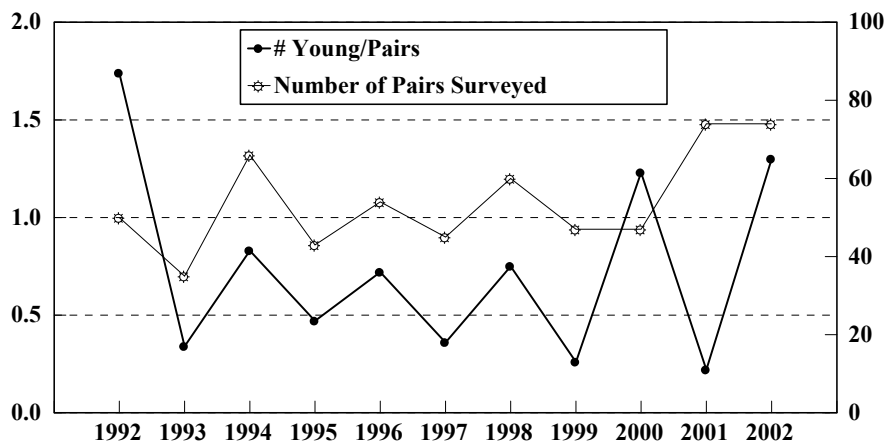


Figure 4. The number of young produced per total number of owl pairs surveyed to protocol on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2002.

Table 4. Summary of reproductive success surveys for northern spotted owls on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2002.

Year	# Pairs Checked	# Pairs Fledging Young	# Young Fledged	% Pairs Producing Young	Average # of Young/Successful Pair	Average # of Young/Pair
1992	50	45	87	90	1.93	1.74
1993	35	8	12	23	1.50	0.34
1994	66	30	55	46	1.83	0.83
1995	43	12	20	28	1.67	0.47
1996	54	25	39	46	1.56	0.72
1997	45	11	16	24	1.46	0.36
1998	60	33	45	55	1.36	0.75
1999	47	7	12	15	1.71	0.26
2000	47	33	58	70	1.76	1.23
2001	74	10	16	14	1.60	0.22
2002	74	51	96	69	1.88	1.30

The average number of young produced per pair in LSRs ($O = 0.71$, $SE = 0.259$, $n = 6$; min. = 0.07, max. = 1.38), while similar to Matrix areas ($O = 0.66$, $SE = 0.134$, $n = 6$; min. = 0.20, max. = 1.04), has fluctuated more widely (Appendix 3, Table 5). For both LUA, this value equaled or exceeded any of the previous five years in 2002. We are investigating the association between the availability of suitable habitat, owl productivity and LUA.

In 2002, the number of young produced per pair for all LSRs (1.22) was greater than the mean for all years of the study ($O = 0.70$, $SE = 0.191$, $n = 6$; min. = 0.067, max. = 1.22) (Appendix 3). Reproductive success for LSR 225 in 2002 was 1.31 young per pair. Over the last six years an average of 0.74 young were fledged per pair in LSR 225 ($SE = 0.279$; min. = 0.18, max. = 1.83). The average number of young fledged per pair in LSR 226 in 2002 (1.40) was greater than the mean for the preceding years ($O = 0.74$, $SE = 0.259$, $n = 6$; min. = 0.0, max. = 1.55). The average reproductive success of owl pairs in LSR 227 (1.39) was the highest recorded ($O = 0.68$, $SE = 0.210$, $n = 6$; min. = 0.0, max. = 1.39). The smaller LSRs continue to experience relatively greater fluctuations in the number of young fledged per pair, reflecting small sample sizes. Young were not detected with the only pair located at LSR 228. Three breeding pairs fledged six young in LSR 229 during 2002, raising the average reproductive success for all years to 0.95 per pair ($SE = 0.338$, $n = 6$; min. = 0.0, max. = 2.00).

Table 5. Summary of reproductive success surveys for northern spotted owls, stratified by Land-use Allocation, on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1997-2002.

LUA ^a	Year	Number of Pairs Checked	Number of Pairs Fledging Young	Number of Young Fledged	Percentage of Pairs Producing Young	Average Number of Young/Successful Pair	Average Number of Young/Pair	Mean Fecundity ^b , # Females
Matrix	1997	16	5	7	31	1.40	0.44	0.219 (16)
	1998	18	10	13	56	1.30	0.72	0.361 (18)
	1999	14	6	10	43	1.67	0.71	0.357 (14)
	2000	14	7	12	50	1.71	0.86	0.429 (14)
	2001	20	3	4	15	1.33	0.20	0.100 (20)
	2002	23	12	24	52	2.00	1.04	0.522 (23)
LSR	1997	27	6	9	22	1.50	0.33	0.167 (27)
	1998	35	21	30	60	1.43	0.86	0.429 (35)
	1999	30	1	2	3	2.00	0.07	0.032 (31)
	2000	28	23	40	82	1.74	1.43	0.690 (29)
	2001	47	7	12	15	1.71	0.26	0.128 (47)
	2002	45	34	62	76	1.82	1.38	0.690 (45)

^aSites with Land-use Allocation designation "Other" not reported.

^bAverage fecundity estimate = number of female young produced per female owl (assume a 1:1 sex ratio of young at birth).

In 2002, average fecundity was 0.649 ($SE=0.053$, $n = 74$) for all females (Figure 5), which was higher than all other years except 1992. Average fecundity was 0.657 ($SE = 0.053$, $n = 70$) for adults, 0.500 ($SE = 0.287$, $n = 4$) for second year subadults and 0 ($n = 2$) for first year subadults.

Fecundity rates for all females (adult and subadults) in the Matrix and LSRs has followed a pattern similar to reproductive success for pairs. The average fecundity recorded for 2002 in both LSR (0.69) and Matrix (0.52) allocations was greater than or equaled any preceding year ($O = 0.31$, $SE = 0.133$, $n = 6$; $min. = 0.03$, $max. = 0.69$ and $O = 0.28$, $SE = 0.083$, $n = 6$; $min. = 0.10$, $max. = 0.52$: respectively).

Bandings/Re-observation

We banded 110 owls (87 fledglings, 4 subadults and 19 adults) on the study area in 2002. There were a total of 154 banded owls of known identity in the study population. Based on re-observations of banded owls (excluding juveniles), the minimum average age for males was 6.8 years ($SE = 0.426$, $n = 81$) and 6.3 years ($SE = 0.414$, $n = 73$) for females. The oldest owl in the sample was at least 18 years old.

There were 8 major inter-territory movements of owls in 2002. Four owls originally banded as fledglings (1994, 1998, 2000 [2]) were recaptured as territorial adults/subadults. Four adult owls were recaptured or resighted at new locations.

Spotted Owl Diets

We initiated an analysis of northern spotted owl diets in 2000. A total of 356 pellets representing 1156 identified prey specimens were collected at 63 owl sites in 2000 and 2001. The majority of the biomass in the sample consisted of northern flying squirrels (*Glaucomys sabrinus*) and woodrat species (*Neotoma cinerea* and *Neotoma fuscipes*). The representation of woodrats followed a north/south and west/east gradient (Figure 5). The sample of pellets collected in 2002 will be analyzed by spring 2003.

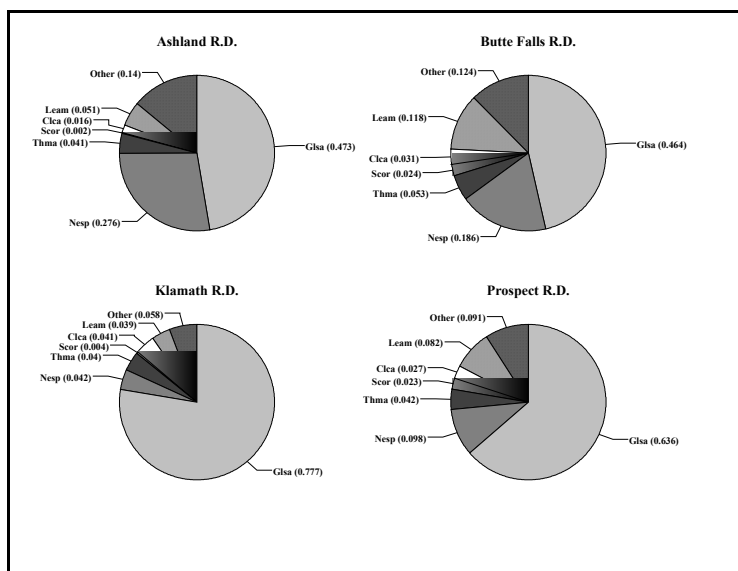


Figure 5. Biomass proportion of prey items (by Ranger District) collected from spotted owl locations on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 2000-2001. Clca = *Clethrionomys californicus*, Glsa = *Glaucomys sabrinus*, Nesp = *Neotoma cinerea* and *Neotoma fuscipes*, Leam = *Lepus americana*, Scor = *Scapanus orarius*, Thma = *Thomomys mazama*.

Barred Owls

The range of northern barred owls (*Strix varia*) has expanded during the last century and now overlaps that of northern spotted owls. Barred owls were first detected within the boundaries of the Southern Cascades Study Area in 1981. Barred owls appear to displace spotted owls from their territories (Kelly 2001). The effect of displacement on survival is unknown but may well affect the analysis of spotted owl population trends. Since 1997, the percentage of historic territories with both spotted owls and barred owls or barred owls only has increased five fold from 3.3 to 17.3% (Figure 6). Additional research is needed to evaluate and predict the effects of barred owl range expansion on spotted owls (Kelly 2001).

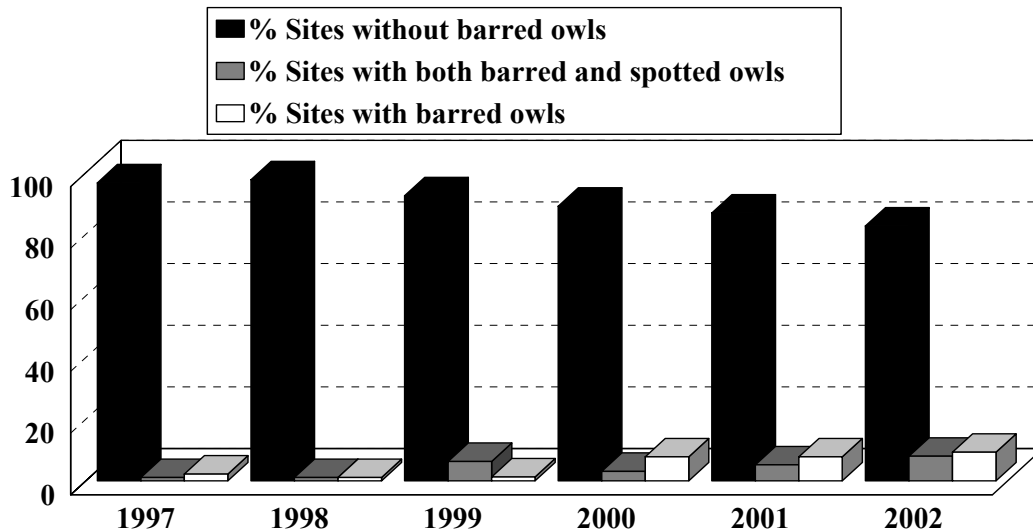


Figure 6. The percentage of historic spotted owl territories surveyed to protocol relative to barred owl occupancy on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1997-2002.

8. Discussion for FY 2002:

In 2002 efforts to reduce the potential for undetected internal emigration by banded owls within and adjacent to the study area were continued by:

- a. coordinating our effort with personnel from Crater Lake National Park, including them on our banding permit and assisting with their banding program. Four adult owls and two juveniles were banded on the park in 2002 (Johnson 2002). We hope that this sample of owls might be included with the sample of owls on the Rogue River and Winema National Forests in the next Effectiveness Monitoring Workshop for Northern Spotted Owls scheduled for 2003 (Lint et al. 1999).
- b. increasing field crew size with an additional part-time employee. We were able to complete surveys of more locations within the study area and improve the quality of our efforts at the sample of sites surveyed in 2001.

In 2001, we reviewed records of surveys conducted by U.S. Forest Service personnel in the years prior to the formal initiation of the monitoring study. Using this data we have worked to incorporate more historic owl locations in our sample and to better quantify the number of distinct owl territories in the study area. In 2002, four sites were consolidated into two sites based on reviews of historic records. Two sites were combined into a single site based on reobservations of banded owls moving between adjacent areas.

The total number of owl territories surveyed annually on the study has continued to increase despite the combination of some sites. The increase in survey areas is partly due to detections of owls at previously undocumented sites within the boundaries of the study. The number of spotted owl sites surveyed in 2002 was greater than in any preceding year (162). However, there remain three known spotted owl territories within the study area that have not been resurveyed as a part of the present monitoring effort.

An active spotted owl nest site within the study area was logged in 2002. This situation has brought to light the need for greater communication of the projects survey results with land managers. Steps have been taken to provide data to U.S. Forest Service personnel in a more timely and consistent manner.

9. Acknowledgments:

Many people have contributed to the success of this project, including: Tim Burnett (Wildlife Biologist, Boise, Inc.), Jim Goode (Zone Wildlife Biologist, Butte Falls and Prospect Ranger Districts, Rogue River National Forest), Jim Harper (Wildlife Biologist, Butte Falls Resource Area, Medford District BLM), Aaron Johnson (Wildlife Technician, Crater Lake National Park), Trish Lapomardo (Wildlfe Biologist, Klamath Falls Resource Area, Lakeview District BLM), Michael Murray (Terrestrial Ecologist, Crater Lake National Park), Kent Russell (District Ranger, Klamath Ranger District, Winema National Forest) and Jen Sanborn (South Zone Wildlife Biologist, Klamath and Chiloquin Ranger Districts, Winema National Forest). We also thank the Rogue River and Winema National Forest Supervisors Offices', the Regional Office of the U.S. Forest Service, the Klamath Falls and the Portland Offices' of the U.S. Fish and Wildlife Service for their support.

10. Research Plans for FY 2003:

- a. Continue the demographic study, including stratification of owl sites by Land-use Allocation.
- b. Continue the collection and analysis of spotted owl pellets.
- c. Continue the collection of data on northern spotted owl nest trees/nest sites and investigate their historic fire disturbance patterns.
- d. Continue to assist personnel from Crater Lake National Park with their banding program.
- e. Participate in a workshop to analyze range-wide demographic data of northern spotted owls in December 2003 as required by the *Northern Spotted Owl Effectiveness Monitoring Plan for the Northwest Forest Plan* (Lint et al. 1999).

11. Presentations and Technology Transfer Completed in FY 2002:

Posters.

- a. Anthony, R., F. Wagner, S. Andrews, W. King, T. O'Brien, T. Phillips and M. Shannon. 2002. Demographic characteristics of northern spotted owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades; Effectiveness Monitoring for the Northwest Forest Plan. Presented at Celebrate the Harvest. September 14, 2002, Southern Oregon Research and Extension Center, Central Point, Oregon, USA.

Technology Transfers.

- a. R.G. Anthony, F. Wagner and S. Andrews participated in data coordination efforts with personnel from other demographic studies.
- b. Project personnel provided the USDA-USFS Ranger Districts, USDI-BLM Resource Areas, and USDI-Crater Lake National Park with owl location information and have coordinated surveys.

12. Duration of the Study:

- a. Initiated in FY 1992.
- b. This project is part of the long-term *Northern Spotted Owl Effectiveness Monitoring Plan for the Northwest Forest Plan* (Lint et al. 1999).

13. Literature Cited:

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Appendix 1. Occupancy status of surveyed sites within the five Late-Successional Reserves (LSRs) in the Southern Cascades Study Area, Rogue River and Winema National Forest, Oregon, 1997-2002.

<u>LSR-225</u>			<u>1997</u>			<u>1998</u>			<u>1999</u>			<u>2000</u>			<u>2001</u>			<u>2002</u>	
Site Name	MSNO ^a	OS ^b	RS ^c	YP ^d	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP
Abbott Creek RNA	2675	P	N	0	UN	N	U	P	N	0	UN	N	0	P	N	0	P	Y	2
Abbott Creek RNA West	3599	P	N	0	P	Y	1	P	N	0	P	Y	1	P	N	0	P	Y	2
Bert Creek	0579	P	N	0	P	Y	1	P	Y	2	P	Y	2	P	N	0	P	N	0
Betsy	4284	NR	N	0	NR	N	0	SD	N	0	UN	N	0	UN	N	0	UN	N	0
Buck Canyon	1058	P	N	0	P	Y	1	P	N	0	P	Y	2	P	N	0	P	Y	2
Coco	0616	P	N	0	P	Y	0	NR	N	U	P	Y	2	P	N	U	P	Y	2
Foster Creek	3594	P	N	0	P	Y	0	P	N	U	P	Y	2	P	N	0	P	Y	2
Foster Glades	3592	P	Y	2	NR	N	0	P	N	0	P	Y	2	P	N	0	P	Y	1
Foster-Styx	4285	P	N	0	NR	N	U	NR	N	U	SU	N	U	UN	N	0	UN	N	0
Hamaker	3597	UN	N	0	NR	N	U	NR	N	U	SU	N	U	SU	N	U	SU	N	U
Hershberger Creek	1052	NR	N	U	SD	N	U	NR	N	U	SU	N	U	P	N	0	P	Y	1
Ice Creek	4287	UN	N	0	SD	N	U	A	N	0	PU	N	U	P	N	0	P	Y	2
Log Pile	2702	P	N	0	NR	N	U	PU	N	0	RM	N	U	P	N	0	P	Y	2
Meadow Creek	2685	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SU	N	U
Minnehaha Creek	3596	UN	N	0	SU	N	U	UN	N	0	UN	N	0	P	N	0	P	Y	2
Rabbit Ears Creek	3595	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	N	0
Rogue-Umpqua	3593	-	-	-	-	-	-	-	-	-	RM	N	U	UN	N	0	I	N	0
Soda Springs	4286	SU	N	U	SU	N	U	P	P	U	SU	N	U	SU	N	U	UN	N	0
Travail Creek	2693	P	N	0	P	Y	1	P	P	0	UN	N	0	UN	N	0	UN	N	0
Wolf Peak	0577	P	Y	0	P	N	0	SU	SU	U	RM	N	U	P	Y	2	P	N	0

(Cont.)

<u>LSR-226</u>			<u>1997</u>			<u>1998</u>			<u>1999</u>			<u>2000</u>			<u>2001</u>			<u>2002</u>	
Site Name	MSNO	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP
29 Creek	0614	UN	N	0	NR	N	U	NR	N	U	P	N	0	UN	N	0	SU	N	U
Bessie Creek	2703	-	-	-	-	-	-	-	-	-	UN	N	0	UN	N	0	P	Y	2
Bessie Rock	0585	RM	N	U	RM	N	0	RM	N	0	P	Y	2	UN	N	0	PU	N	0
Big Ben	3653	UN	N	0	NR	N	U	UN	N	U	UN	N	0	P	N	0	UN	N	0
Black Bear Swamp	3652	UN	N	0	NR	N	U	UN	N	0	UN	N	0	I	N	0	UN	N	0
Cold Springs	4282	UN	N	0	SU	N	U	UN	N	0	UN	N	0	UN	N	0	UN	N	0
Elkhorn Creek	2689	NR	N	U	NR	N	U	SD	N	U	UN	N	0	P	N	0	P	Y	2
Fool Creek	1876	NR	N	U	NR	N	U	NR	N	U	SU	N	U	UN	N	0	I	N	0
Geyser Springs	4291	UN	N	0	UN	N	0	P	N	0	P	Y	2	P	Y	2	P	N	0
Ginkgo Creek North	2682	P	N	0	P	N	0	NR	N	U	I	N	0	I	N	0	SU	N	U
Ginkgo Creek South	2695	P	N	0	P	N	0	P	N	0	P	Y	2	P	N	0	P	Y	2
Imnaha	1005	P	Y	1	P	Y	2	P	N	0	P	Y	1	P	Y	1	P	Y	2
King Spruce Trail	2698	P	N	0	P	N	0	RM	N	U	P	Y	2	P	N	0	P	Y	2
Lava Ridge	3633	UN	N	U	SU	N	U	P	N	0	P	Y	2	P	N	0	P	Y	2
Lick Creek	1048	-	-	-	UN	N	0	NR	N	U	P	N	0	UN	N	0	UN	N	0
Lodgepole	0350	NR	N	U	SD	N	U	NR	N	U	UN	N	0	SU	N	U	SU	N	U
Lower Red Blanket	2696	NR	N	U	P	Y	1	P	N	0	A	Y	2	P	N	0	P	Y	1
Middle Fork	4077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	UN	N	0
Nichols/Green Creek ^f	0602	NR	N	U	NR	N	U	UN	N	0	UN	N	0	UN	N	0	SU	N	U
Onion Springs	2690	UN	N	0	NR	N	U	NR	N	U	UN	N	0	UN	N	0	P	Y	2
Otter Spring	0587	P	N	0	P	Y	2	P	N	0	P	Y	0	SU	N	U	P	N	0

(Cont.)

<u>LSR-226</u>			<u>1997</u>			<u>1998</u>			<u>1999</u>			<u>2000</u>			<u>2001</u>			<u>2002</u>	
Site Name	MSNO	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP
Red Blanket Springs	4295	-	-	-	-	-	-	-	-	-	-	-	-	P	Y	2	P	Y	2
Rustler Peak	3651	P	N	0	P	Y	1	P	N	0	P	Y	2	P	N	0	P	Y	2
South Fork	1006	SU	N	U	P	N	U	P	N	0	P	Y	2	P	N	0	P	N	0
Upper Elkhorn Creek ^g	-	-	-	-	P	N	0	UN	N	U	SU	N	U	-	-	-	-	-	-
Upper Lick Creek ^h	3620	NR	N	U	NR	N	U	NR	N	U	UN	N	0	UN	N	0	-	-	-
Upper Red Blanket	1053	P	N	0	P	Y	2	P	N	0	UN	N	0	P	Y	0	P	Y	2
Varmint Creek	1872	P	N	U	P	N	0	P	N	0	SD	N	U	P	N	0	P	N	U
Wickiup Creek	0611	P	N	0	P	N	0	P	N	U	UN	N	U	UN	N	0	SU	N	U
Zimmerman Butte	0617	P	Y	1	P	Y	2	P	N	0	P	N	0	UN	N	0	SU ⁱ	N	U

(Cont.)

<u>LSR-227</u>			<u>1997</u>			<u>1998</u>			<u>1999</u>			<u>2000</u>			<u>2001</u>			<u>2002</u>	
Site Name	MSNO	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP
Beaver Dam	3644	SU	N	U	P	Y	2	PU	N	0	SU	N	0	P	N	0	PU	N	U
Big Draw Creek	4274	P	N	U	P	N	U	P	N	0	P	N	0	P	Y	2	P	Y	2
Bigfoot	0626	SU	N	U	RM	N	U	P	N	0	RM	N	U	UN	N	0	UN	N	0
Billie Creek	2749	-	-	-	-	-	-	-	-	-	-	-	-	P	N	0	P	Y	1
Brown Mountain	1782	SD	N	U	P	N	U	NR	N	U	UN	N	0	UN	N	0	UN	N	0
Cloud Lakes East	2387	-	-	-	-	-	-	UN	N	0	P	N	U	UN	N	0	SU	N	U
Cox Butte	0944	P	N	U	PU	N	U	RM	N	U	RM	N	U	A	N	0	P	Y	1
Crystalline Springs	2263	NR	N	U	SU	N	0	NR	N	U	UN	N	0	UN	N	0	UN	N	0
Custer	3647	-	-	-	-	-	-	-	-	-	UN	N	U	SU	N	U	UN	N	0
Eagles Roost	2754	UN	N	0	UN	N	0	UN	N	0	UN	N	0	SU	N	U	RM	N	U
Ellick Creek	0622	-	-	-	-	-	-	-	-	-	-	-	-	P	N	0	P	N	0
Fish Lake	3641	SU	N	U	P	Y	2	RF ⁿ	N	U	P	Y	2	P	Y	2	RF	N	U
Fourmile Creek	1786	P	N	0	P	Y	1	P	N	0	P	Y	1	P	N	0	P	Y	2
Grizzly	0625	-	-	-	-	-	-	-	-	-	-	-	-	SU	N	U	P	Y	2
Heppsie	0990	RM	N	0	P	Y	0	P	N	0	P	N	0	P	N	0	P	N	0
High Knob	0039	-	-	-	UN	N	0	SD	N	U	P	Y	1	P	N	0	P	N	0
Iron Spring	4279	P	Y	2	P	Y	1	P	N	0	P	Y	1	P	N	0	P	Y	2
Lake of the Woods	2240	UN	N	0	UN	N	0	NR	N	U	UN	N	0	SU	N	U	UN	N	0
Lava Lakes	3643	P	N	0	P	Y	1	P	N	0	P	Y	0	P	Y	0	P	Y	2
Little Elk Prairie	0995	NR	N	U	UN	N	U	NR	N	U	P	N	U	UN	N	0	UN	N	0
Low Echo North	2241	NR	N	U	SD	N	0	SU	N	U	UN	N	0	SU	N	U	SU	N	U
Low Echo South	2585	-	-	-	-	-	-	-	-	-	NR	N	U	UN	N	0	UN	N	0

(Cont.)																			
<u>LSR-227</u>			<u>1997</u>			<u>1998</u>			<u>1999</u>			<u>2000</u>			<u>2001</u>			<u>2002</u>	
Site Name	MSNO	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP
Lower Rock Creek	2237	P	N	0	P	N	0	P	N	0	P	Y	U	P	N	0	P	Y	2
Lower Rock Creek II	1776	P	N	0	NR	N	U	NR	N	U	UN	N	0	P	N	0	P	MF	U ^j
Nannie Creek	2540	UN	N	U	P	N	0	P	N	U	RM	N	U	P	N	0	P	Y	2
PCT	3646	P	Y	2	P	Y	2	P	N	0	P	Y	2	P	N	0	UN	N	0
Robinson Butte	0624	SD	N	U	SD	N	U	SD	N	U	UN	N	0	P	N	0	PU	N	U
Robinson Prairie	-	NR	N	U	NR	N	U	SD	N	U	UN	N	0	SU	N	U	UN	N	0
Rocky Point	2239	SD	N	U	UN	N	0	SD	N	U	UN	N	0	P	N	0	P	Y	2
Rye Flat	3640	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	UN	N	0
Rye Spur	1783	A	N	U	P	N	U	RM	N	U	UN	N	0	SU	N	U	RM	N	U
Short Creek Prairie	3645	P	N	0	P	N	0	SD	N	0	RM	N	U	SU	N	U	RM	N	U
South Mountain	2243	UN	N	0	P	Y	2	P	N	0	UN	N	0	SU	N	U	UN	N	0
Switchback	3642	NR	N	U	UN	N	0	NR	N	U	SU	N	U	SU	N	U	UN	N	0
Upper Cox Creek	-	NR	N	U	NR	N	U	NR	N	U	UN	N	0	UN	N	0	UN	N	0
Upper/West Rock Creek	1773	-	-	-	-	-	-	-	-	-	UN	N	0	UN	N	0	UN	N	0
West Billie Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SU	N	U
West Fish Lake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	PU	N	U
West Rock Creek II	2581	-	-	-	-	-	-	-	-	-	-	-	-	P	N	0	P	Y	2

(Cont.)

<u>LSR-228</u>			<u>1997</u>			<u>1998</u>			<u>1999</u>			<u>2000</u>			<u>2001</u>			<u>2002</u>	
Site Name	MSNO	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP
Buck Peak	0024	-	-	-	UN	N	U	NR	N	U	UN	N	0	P	Y	1	P	N	0
High Knob II	1785	-	-	-	SU	N	0	RM	N	U	UN	N	0	UN	N	0	UN	N	0
Upper Clover Creek	2758	-	-	-	P	Y	1	P	N	0	RM	N	U	UN	N	0	UN	N	0

<u>LSR-229</u>			<u>1997</u>			<u>1998</u>			<u>1999</u>			<u>2000</u>			<u>2001</u>			<u>2002</u>	
Site Name	MSNO	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP	OS	RS	YP
Cedar Springs	2244	P	N	U	P	Y	1	P	N	0	P	Y	2	P	N	0	P	Y	2
Dry Creek	0007	P	N	U	P	Y	1	P	N	0	P	Y	2	P	N	0	RM	N	U
Sevenmile Creek	2762	RM	N	U	P	Y	2	P	N	0	P	Y	1	P	N	0	P	Y	2
Upper Sevenmile Creek	2247	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	UN	N	0
Wildcat Creek	2266	P	Y	1	P	N	0	P	N	0	RM	N	U	P	N	0	P	Y	2

^aMSNO = Master Site Number.

^bOS = occupancy status; P = pair, UN = unoccupied, NR = no response after →3 night visits, SD = response with →3 night visits but social status unknown, SU = response with ≤3 night visits but social status unknown, A = owls in addition to pair, PU = one owl meets residency status while a second owl of the opposite sex was detected but did not meet pair or resident status, RM = resident male, I = response at site attributed to owls overlapping from an adjacent site, RF = resident female, MF= mortality of nesting female.

^cRS = reproductive status; N = Non-reproductive, Y= Reproductive.

^dYP = young produced.

^eHershberger Creek and Rabbit Ears Creek separated in 2002; previous efforts reallocated to Hershberger Creek.

^fGreen Creek and Nichols Creek combined in 2002.

^gElkhorn Creek and Upper Elkhorn Creek combined in 2001

^hLick Creek and Upper Lick Creek combined in 2002.

ⁱPair located at site September 2002.

^jNest site logged prior to fledging.

Appendix 2. Summary statistics of site occupancy for the Late-Successional Reserves (LSRs) of the Southern Cascades Study Area, Rogue River and Winema National Forest, Oregon, 1997-2002.

LSR ^a	Year	Total Number of Sites Surveyed to Protocol	Total Number of Occupied Sites	Percent of Occupied Sites	Percent of All Sites with Pairs	Percent of Occupied Sites with Pairs
225	1997	15	12	80.0	73.3	91.7
	1998	10	9	90.0	70.0	77.8
	1999	12	11	91.7	83.3	90.9
	2000	18	14	77.8	38.9	50.0
	2001	18	14	77.8	66.7	85.7
	2002	20	15	75.0	65.0	86.7
226	1997	20	12	60.0	50.0	83.3
	1998	19	16	84.2	68.4	81.3
	1999	20	14	70.0	60.0	85.7
	2000	28	15	53.6	46.4	86.7
	2001	29	16	55.2	44.8	81.3
	2002	28	22	78.6	57.1	72.7
227	1997	18	14	77.8	55.6	71.4
	1998	26	19	73.1	61.5	84.2
	1999	19	17	89.5	63.2	70.6
	2000	34	18	52.9	32.4	61.1
	2001	36	28	77.8	50.0	64.3
	2002	39	25	64.1	46.2	72.0
228	1997	-	-	-	-	-
	1998	3	2	66.6	33.3	50.0
	1999	2	2	100	50.0	50.0
	2000	3	1	33.3	0.00	0.00
	2001	3	1	33.3	33.3	100
	2002	3	1	33.3	33.3	100
229	1997	4	4	100	75.0	75.0
	1998	4	4	100	100	100
	1999	4	4	100	100	100
	2000	4	4	100	75.0	75.0
	2001	4	4	100	100	100
	2002	5	4	80.0	60.0	75.0

Appendix 3. Summary statistics of reproductive parameters for the Late-Successional Reserves (LSRs) of the Southern Cascades Study Area, Rogue River and Winema National Forest, Oregon, 1997-2002.

LSR ^a	Year	Number Pairs Checked for Nesting ^{b,c}	Number Pairs Attempting to Nest	Number Pairs Checked for Reprod ^d	Number of Pairs with Fledged Young	Number of Young Fledged	Percent of Pairs Producing Young	Number Young per Successful Pair	Number of Young per Total Number of Pairs	Mean Fecundity ^b , # Females
225	1997	7	1	11	1	2	9.09	2.00	0.18	0.091 (11)
	1998	3	3	7	4	4	57.1	1.00	0.57	0.286 (7)
	1999	3	2	6	1	2	16.7	2.00	0.33	0.143 (7)
	2000	6	6	6	6	11	100	1.83	1.83	0.917 (6)
	2001	8	1	11	1	2	9.09	2.00	0.18	0.091 (11)
	2002	9	8	13	10	17	76.9	1.7	1.31	0.694 (13)
226	1997	5	2	8	2	2	25.0	1.00	0.25	0.125 (8)
	1998	7	6	12	6	10	100	1.67	0.83	0.417 (12)
	1999	7	0	11	0	0	0	0.00	0.00	0.000 (11)
	2000	11	10	11	9	17	81.8	1.89	1.55	0.773 (11)
	2001	12	4	13	3	5	23.1	1.67	0.39	0.192 (13)
	2002	11	8	15	11	21	73.3	1.91	1.40	0.7 (15)
227	1997	3	1	7	2	4	28.6	2.00	0.57	0.286 (7)
	1998	8	7	11	7	11	63.6	1.57	1.00	0.500 (11)
	1999	6	0	9	0	0	0	0.00	0.00	0.000 (11)
	2000	7	6	8	5	7	62.5	1.40	0.88	0.389 (9)
	2001	13	3	18	2	4	11.1	2.00	0.22	0.111 (18)
	2002	12	11	13	10	18	76.9	1.80	1.39	0.692 (13)

(Cont.)										
LSR ^a	Year	Number Pairs Checked for Nesting ^{b,c}	Number Pairs Attempting to Nest	Number Pairs Checked for Reprod ^d	Number of Pairs with Fledged Young	Number of Young Fledged	Percent of Pairs Producing Young	Number Young per Successful Pair	Number of Young per Total Number of Pairs	Mean Fecundity ^b , # Females
228	1997	-	-	-	-	-	-	-	-	-
	1998	0	0	1	1	1	100	1.00	1.00	0.500 (1)
	1999	0	0	1	0	0	0	0.00	0.00	0.000 (0)
	2000	0	0	0	0	0	0	0.00	0.00	-
	2001	0	0	1	1	1	100	1.00	1.00	0.500 (1)
	2002	0	0	0	0	0	0	0.00	0.00	-
229	1997	1	1	1	1	1	100	1.00	1.00	0.500 (1)
	1998	0	0	4	3	4	75.0	1.33	1.00	0.500 (4)
	1999	1	0	3	0	0	0	0.00	0.00	0.000 (3)
	2000	3	3	3	3	5	100	1.67	1.67	0.833 (3)
	2001	4	0	4	0	0	0	0.00	0.00	0.000 (4)
	2002	2	2	3	3	6	100	2.00	2.00	1.00 (3)

^aSee Northwest Forest Plan (1994) for LSR descriptions and forest management strategies.

^bIncludes only those pairs with nesting/non-nesting status determined by June 1 or June 15 (elevations ≥ 1375 meters), plus females examined for the presence of a brood patch by June 21.

^cNumbers refer only to managed points within the LSR.

^dReproductive success estimates were calculated using August 31 as the cutoff date.

^eFecundity is calculated as the total number of female young fledged per female checked for reproductive success by August 31 (1:1 sex ratio of fledged young at birth is assumed).